

(b) Amendments to the Claims

Please amend claims 1-9, 12-17, 20-23, 25 and 34 as follows. A detailed listing of all the claims that are in the application is provided.

1. (Currently Amended) A lead zirconate titanate-based thin film, wherein the film is an epitaxial crystal thin film on a substrate ~~[[which]]~~, said thin film has a chemical composition represented by the general formula $Pb_{1-x} Ln_x Zr_y Ti_{1-y} O_3$, ~~[[()]]~~ wherein Ln represents any one selected from the group consisting of lanthanum, lanthanoid elements, niobium, calcium, barium, strontium, iron, manganese and tin; and $0 \leq x \leq 1, 0.43 \leq y \leq 0.65$ ~~[[()]]~~ and ~~whose~~ wherein the film orientation is {111} ~~or (including orientations whose tilt angle from the direction perpendicular to the substrate surface is within 15°~~ ~~[[()]]~~ from {111}.

2. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1, wherein the orientation of the film is (111) ~~(including orientations whose tilt angle from the direction perpendicular to the substrate surface is within 15°~~ ~~[[()]]~~ of {111}.

3. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1, wherein ~~the~~ a half-width of ~~the~~ a locking curve in the circumferential direction of an X-ray pole figure is within 30°.

4. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1, wherein ~~the~~ a half-width of ~~the~~ a locking curve in the circumferential direction of an X-ray pole figure is within 15°.

5. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1, wherein ~~the~~ a half-width of ~~the~~ a locking curve of the crystal is within 15°.

6. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1, wherein ~~the~~ a half-width of ~~the~~ a locking curve of the crystal is within 5°.

7. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1, wherein ~~the~~ a half-width of ~~the~~ a locking curve of the crystal is within 2°.

8. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1, wherein ~~the~~ a half-width of ~~the~~ a locking curve of the crystal is within 1°.

9. (Currently Amended) A lead zirconate titanate-based thin film on a substrate, said thin film having a composition represented by the general formula $Pb_{1-x}Ln_xZr_yTi_{1-y}O_3$ ~~[[()]]~~ wherein Ln represents any one selected from the group consisting of lanthanum, lanthanoid elements, niobium, calcium, barium, strontium, iron, manganese and tin; $0 \leq x < 1$; and $0.43 \leq y \leq 0.57$ ~~[[()]]~~, wherein the relative permittivity - voltage characteristics of the film satisfy the following equation: $\Delta\epsilon/\Delta E \geq 3.0$, wherein ΔE is a change in relative permittivity and $\Delta\epsilon$ is a change in electric field strength (kv/cm).

10. (Original) The lead zirconate titanate-based thin film according to claim 9, wherein the relative permittivity - voltage characteristics satisfy the following equation: $\Delta\epsilon/\Delta E \geq 5.0$.

11. (Original) The lead zirconate titanate-based thin film according to claim 9, wherein the film is an epitaxial film whose orientation is (111) or within 15° from (111).

12. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1 or 11, wherein the {111} face of the epitaxial film is ~~orientated~~ oriented within a tilt angle of 5° , ~~[[()]]~~ including 0° ~~[[()]]~~.

13. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1 or ~~11~~ 12, wherein the {111} face of the epitaxial film is ~~orientated~~ oriented within a tilt angle of 3°, ~~[[()including 0°[()]]]~~.

14. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1 or 9, wherein the substrate is silicon ~~is used for the substrate~~.

15. (Currently Amended) The lead zirconate titanate-based thin film according to claim 14, wherein the silicon is (100) ~~orientated~~ oriented.

16. (Currently Amended) The lead zirconate titanate-based thin film according to claim 14, wherein the silicon is (111) ~~orientated~~ oriented.

17. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1 or 9, wherein the film is formed by MOCVD~~[[;]]~~.

18. (Original) The lead zirconate titanate-based thin film according to claim 1, wherein in the general formula $\text{Pb}_{1-x}\text{Ln}_x\text{Zr}_y\text{Ti}_{1-y}\text{O}_3$, $0.43 \leq y \leq 0.57$.

19. (Original) The lead zirconate titanate-based thin film according to claim 1, wherein in the general formula $\text{Pb}_{1-x}\text{Ln}_x\text{Zr}_y\text{Ti}_{1-y}\text{O}_3$, $0.43 \leq y \leq 0.55$.

20. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1 or 9, wherein the crystal structure is at least any one of tetragonal, cubic ~~and~~ or rhombohedral crystals.

21. (Currently Amended) The lead zirconate titanate-based thin film according to claim 20, wherein at least any two of tetragonal, cubic ~~and~~ or rhombohedral crystals coexist.

22. (Currently Amended) The lead zirconate titanate-based thin film according to claim 1 or 9, wherein at least ~~the~~ a surface of the substrate is electrically conductive.

23. (Currently Amended) A lead zirconate titanate-based thin film, wherein the film is an epitaxial crystal thin film which has a chemical composition represented by the general formula $Pb_{1-x} Ln_x Zr_{1-y} Ti_y O_3$ ~~[[()]]~~ wherein Ln represents any one selected from the group consisting of lanthanum, lanthanoid elements, niobium, calcium, barium, strontium, iron, manganese and tin; and $0 \leq x < 1$, $0.40 \leq y \leq 0.65$ ~~[[()]]~~, ~~whose~~ wherein the film orientation is $\{111\}$ ~~or (including orientations whose tilt angle from the direction perpendicular to the substrate surface is within 15° [[()]] from $\{111\}$, and in which at least any two of tetragonal, cubic~~ and or rhombohedral crystals coexist.

24. (Original) The lead zirconate titanate-based thin film according to claim 23, wherein in the general formula $\text{Pb}_{1-x}\text{Ln}_x\text{Zr}_y\text{Ti}_{1-y}\text{O}_3$, $0.43 \leq y \leq 0.57$.

25. (Currently Amended) A lead zirconate titanate-based epitaxial thin film formed by MOCVD, wherein the film has a chemical composition represented by the general formula $\text{Pb}_{1-x}\text{Ln}_x\text{Zr}_{1-y}\text{Ti}_y\text{O}_3$, ~~[[()]]~~ wherein Ln represents any one selected from the group consisting of lanthanum, lanthanoid elements, niobium, calcium, barium, strontium, iron, manganese and tin; and $0 \leq x < 1$, $0.43 \leq y \leq 0.65$ ~~[[()]]~~ and its wherein the film orientation is {111} ~~(including orientations whose tilt angle from the direction perpendicular to the substrate surface is or within 15°[[()]] of {111}).~~

26. (Original) A dielectric device, comprising the lead zirconate titanate-based thin film according to any one of claims 1, 9, 23 and 25.

27. (Original) A piezoelectric device, comprising the lead zirconate titanate-based thin film according to any one of claims 1, 9, 23 and 25.

28. (Original) An ink jet printer head, comprising the piezoelectric device according to claim 27.

29. (Original) A ferroelectric device, comprising the lead zirconate titanate-based thin film according to any one of claims 1, 9, 23 and 25.

30. (Original) A pyroelectric device, comprising the lead zirconate titanate-based thin film according to any one of claims 1, 9, 23 and 25.

31. (Original) A method according of producing a lead zirconate titanate-based film, wherein a crystal film having a chemical composition represented by the general formula $Pb_{1-x}Ln_xZr_{1-y}Ti_yO_3$ (wherein Ln represents any one selected from the group consisting of lanthanum,lanthanoid elements, niobium, calcium, barium, strontium, iron, manganese and tin; and $0 \leq x < 1$, $0.43 \leq y \leq 0.65$) is epitaxially grown on a substrate at least the surface of which has a {111} orientation or orientation with a tilt angle within 15° from {111} by MOCVD.

32. (Original) The method of producing a lead zirconate titanate-based thin film according to claim 1, wherein $0.45 \leq y \leq 0.57$.

33. (Original) The method of producing a lead zirconate titanate-based thin film according to claim 31, wherein $0.43 \leq y \leq 0.55$.

34. (Currently Amended) A lead zirconate titanate-based thin film, wherein the film is a crystal thin film which has a chemical composition represented by the general formula $Pb_{1-x}Ln_xZr_{1-y}Ti_yO_3$ ~~[[[]]]~~ wherein Ln represents any one selected from the group consisting of lanthanum, lanthanoid elements, niobium, calcium, barium, strontium, iron, manganese and tin; and $0 \leq x < 1$, $0.40 \leq y \leq 0.65$), ~~whose~~ wherein the film orientation is

{111} (including orientations whose tilt angle from the direction perpendicular to the substrate surface is or within 15° [()],)] of {111} and in which at least any two of tetragonal, cubic ~~and~~ or rhombohedral crystals coexist.